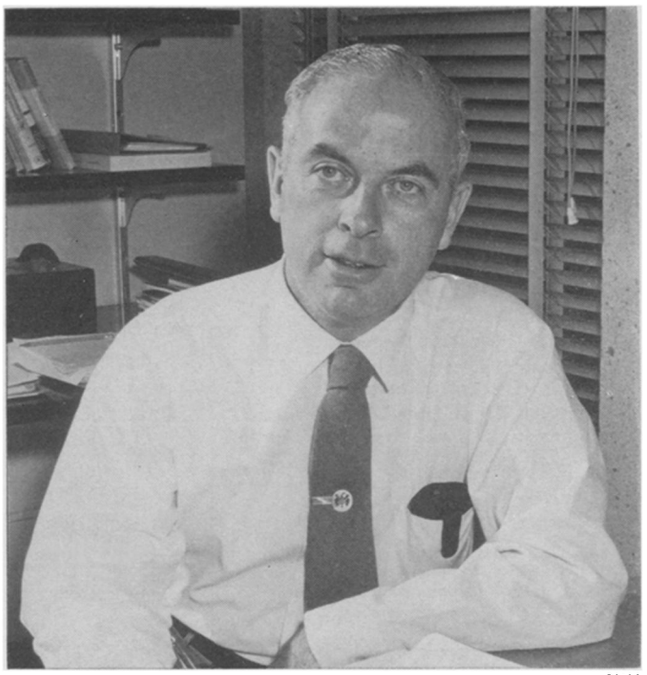
Cat viruses clue to cancer

Using cat leukemia viruses as agents in a detector system, scientists may find human leukemia viruses

by Barbara J. Culliton



NIH

Dr. O'Connor: Definite evidence possible in two years.

Scientists in search of proof that a virus causes leukemia in man have been constrained by the lack of a test system that can provide what they call an authentic sign of its existence. To demonstrate that viruses cause animal cancers they have only to inject a suspect virus into experimental animals and wait and see if those animals develop the disease. Obviously such an approach is impossible in human beings.

However, scientists at the National Cancer Institute in Bethesda, Md., now have a laboratory system that they think may be the answer to this long-standing problem. Employing cat or feline leukemia viruses as helper agents, they hope to isolate a leukemia virus from cells of human beings.

"We may have definitive evidence in the next two years," says Dr. Timothy E. O'Connor. He has been working in collaboration with Dr. Peter J. Fischinger in the institute's new virus isolation laboratory, which has as many safeguards against accidental contamination as the Lunar Receiving Laboratory where moon rocks are studied.

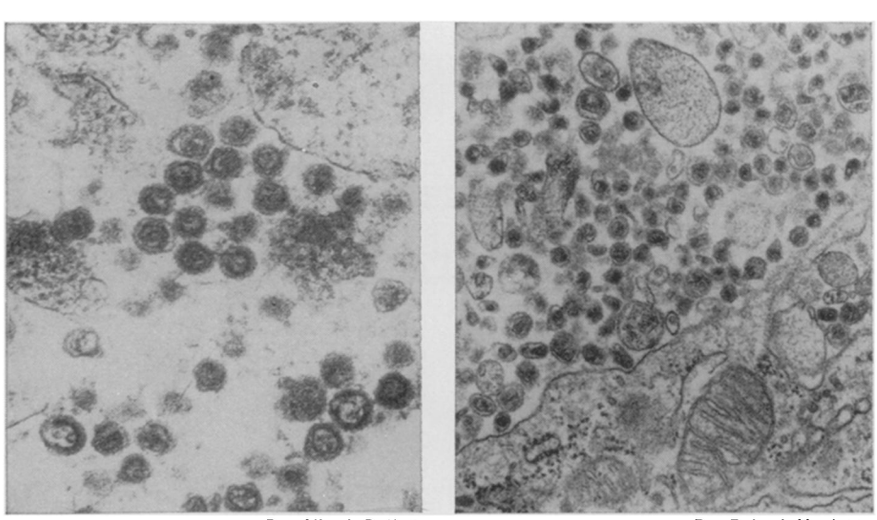
Last summer, Drs. O'Connor and Fischinger showed that the feline leukemia virus crosses the species barrier, infecting human as well as cat cells in tissue culture in laboratory conditions.

Their experiments with the leukemia-causing agent, a core of RNA wrapped in a protein coat, began shortly after it was first identified in 1964 by Dr. Charles G. Rickard, then at Cornell University. This year in Scotland, Dr. Oswald Jarrett and colleagues at the University of Glasgow also showed that FLV infects human cells in culture. "Nevertheless, there is no evidence that this cat virus is a cause of disease in man," Dr. O'Connor emphasizes, adding that the kind of tricks scientists can play in a laboratory experiment bear no necessary relation to what happens in natural circumstances. Besides, he observes, if cat viruses do get into the human body, the immune system probably rejects them most of the time. "Less than a quarter of leukemia patients have cats.

"They are not the main vector," he says.

The fact that feline leukemia viruses infect and grow in human cells means they may become a detector system for finding human leukemia viruses in similar experiments. So far, even though some human virus particles, particularly C-type RNA viruses, are suspected of causing cancer, scientists have been unable to get them to grow in the laboratory where they can be studied (SN: 10/4, p. 308).

In order for a virus—any virus—to infect a cell, it must carry on its surface an antigen that matches the antigenic structure of that cell. It may be that the virus particles isolated from patients with leukemia lack the antigenic component, rendering them incompetent in laboratory situations. Combining these particles, which are probably defective, with the more active feline leukemia viruses with their



Dr. Albert Dalton Dr. Robert Huebner

Cat viruses (left) resemble C-type RNA *particles suspected in human cancer.*

. . . leukemia

known ability to infect human cells, could be the way to get the human virus particles inside cells where they will grow. If this happens—if scientists can force these particles into cells in culture, recover whole viruses and observe cancerous changes in the cells—they will have the proof they need.

Already, the NCI scientists have shown the system works with a certain mouse virus. They fused the genetic core of a mouse sarcoma virus, under pressure in a centrifuge, with the coat of a feline leukemia virus. Thus provided with the essential surface antigens, the sarcoma virus was transported into human cells in culture, where it grew and replicated in sufficient quantity that it could be detected. At the same time, it produced cancer-like changes in the infected cells. Now Dr. O'Connor plans to disguise suspected human virus particles in a FLV coat to achieve similar results.

There are, however, certain difficulties that he predicts will slow the process. One is the technical problem of obtaining specimens of sufficient purity and quantity from human patients. Animals, Dr. O'Connor points out, can be bred for genetic identity and raised in a controlled environment to preclude contamination from microorganisms in the environment. When tissue is taken from a human patient, it inevitably contains a confusing background of pathogens that must be separated from the virus suspected of causing leukemia.

Dr. O'Connor is confident the complications can be overcome in time. "Once we've isolated and identified a human leukemia virus," he says, "we'll wonder why it was so difficult. In 1961, growing a mouse leukemia was a real feat. Today, it is no problem."

Optimistically assuming that his new detector system will work, Dr. O'Connor predicts that the imminent identification of a human leukemia virus will revolutionize cancer research, pointing to viruses that cause other forms of the disease and leading the way to a cure.

While conceding the possibility of producing a leukemia vaccine, he suggests that antiviral drugs are a more likely solution. "The answer will come," he declares, "from investigators, showing the microbiology of viruses, who will learn to subvert viral replication. When we isolate the missing virus, microbiologists will swarm to this challenge and with the wealth of information we already have about the behavior and nature of viruses, chemotherapy will follow in less than 20 years." □